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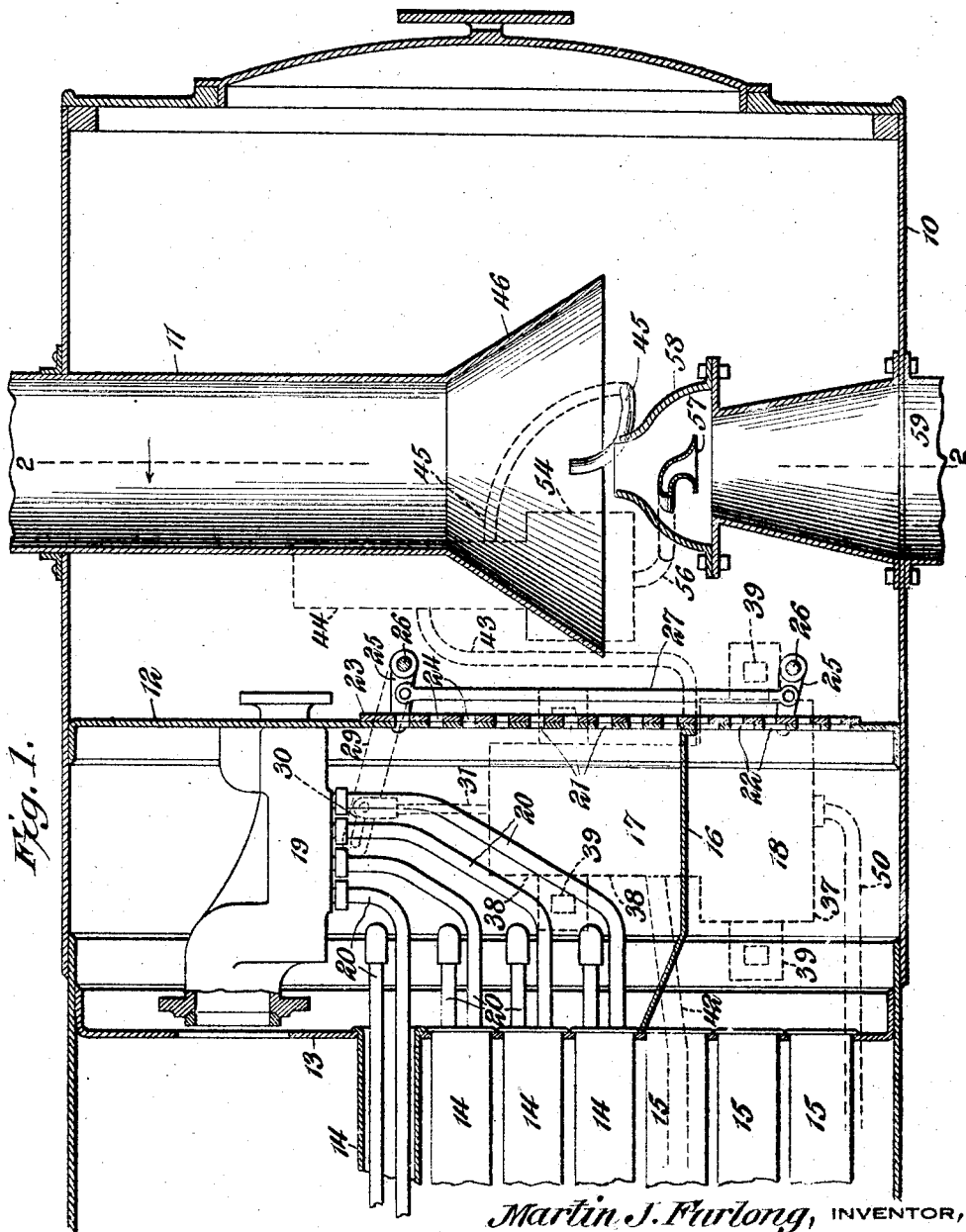
M. J. FURLONG

1,612,007

CONTROLLING DEVICE FOR LOCOMOTIVE SUPERHEATERS

Filed April 9, 1924

3 Sheets-Sheet 1



WITNESSES

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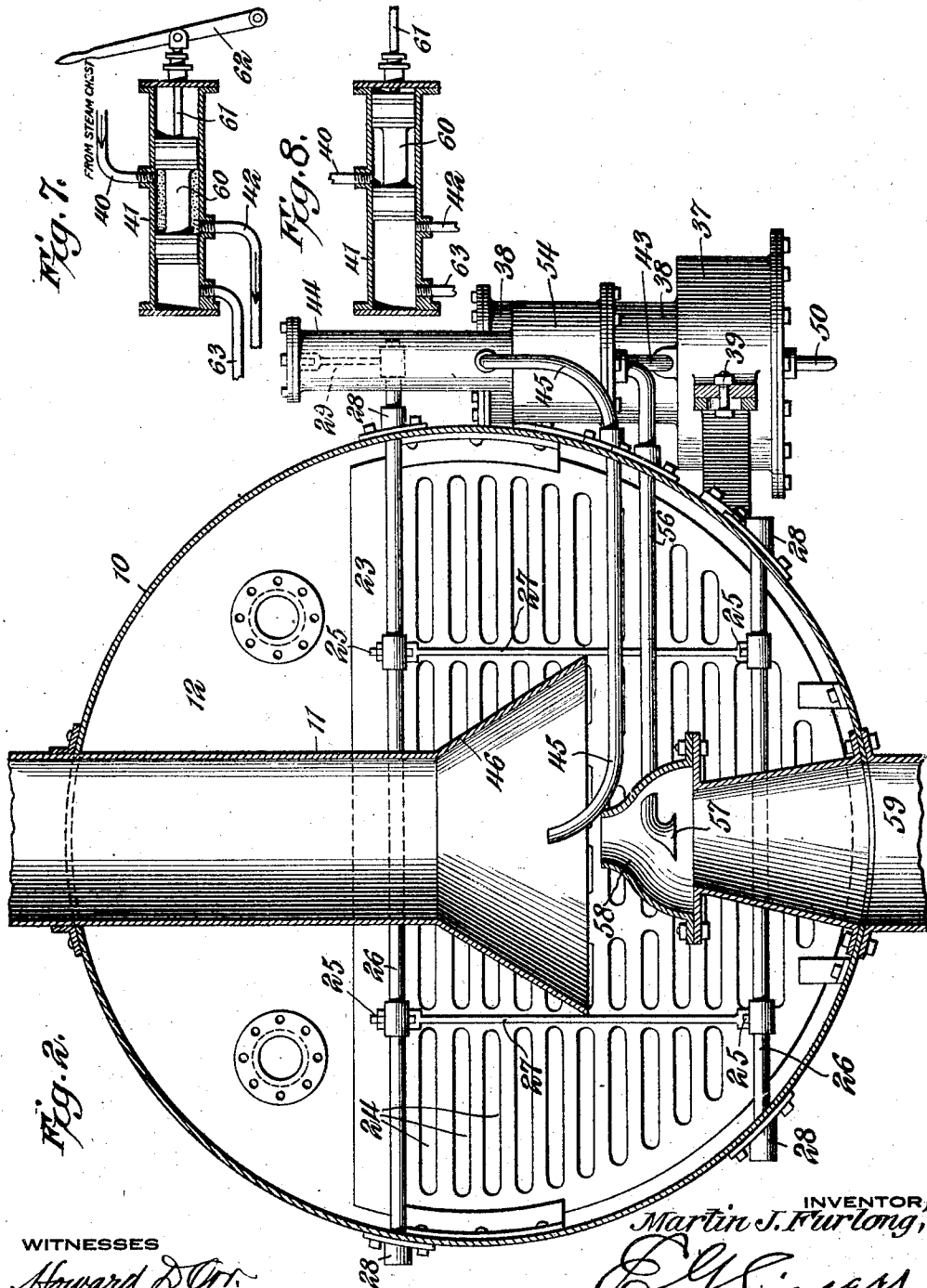
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3 Sheets-Sheet 2



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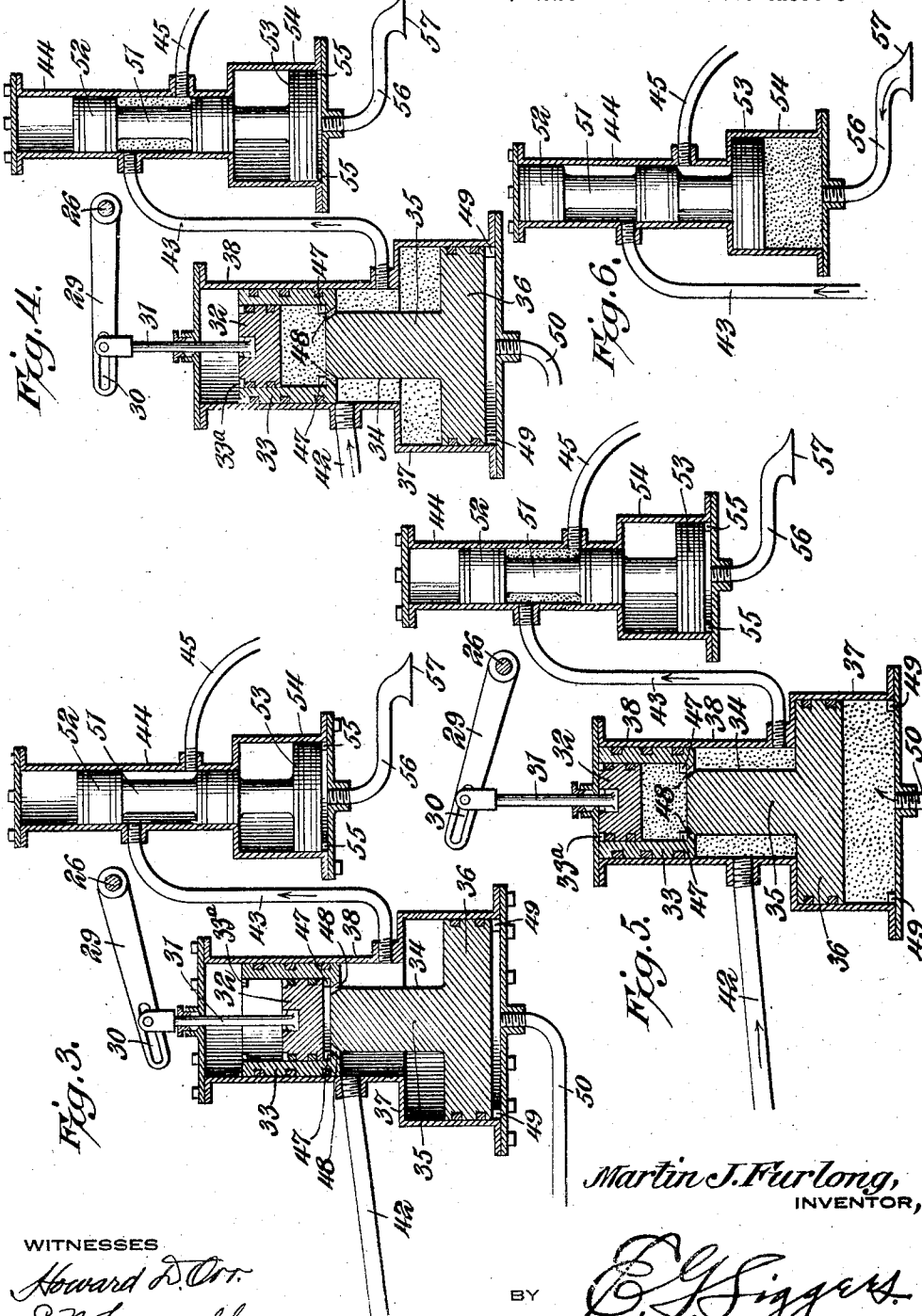
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CONTROLLING DEVICE FOR LOCOMOTIVE SUPERHEATERS.

Application filed April 9, 1924. Serial No. 705,340.

This invention relates to a controlling device for dampers, especially adapted to be used in connection with locomotive superheaters, and is in the nature of an improvement on the damper controlling device disclosed in U. S. Patent No. 1,454,161, issued to me May 8, 1923.

In this class of devices a damper plate usually extends across the major portion of the boiler shell, the upper part of which contains the superheater, and is slidable vertically to three different positions. In the lowermost position of the damper plate the draft is entirely shut off; in the intermediate position the draft through the superheater is still shut off, but the draft through the front end chamber is open; and in the uppermost position of the damper plate all the draft outlets are open.

The general object of the present invention is to provide improved means for controlling the position of the above mentioned damper, this means in its preferred form being actuated by steam from the blower line. Means are also provided whereby the blower line is automatically closed between the damper controlling means and the smoke stack, through the medium of the exhaust from the cylinders, whenever a predetermined speed is attained.

The invention also comprises various novel details of construction and combinations of elements, the advantages of which will be specifically explained in the following detailed description, which is to be read in connection with the accompanying drawings illustrating the preferred form of the invention.

In the drawings:

Figure 1 is a vertical longitudinal section through the front portion of a locomotive having my invention installed therein, the damper being shown in full open position.

Figure 2 is a transverse section taken on the line 2-2 of Figure 1.

Figure 3 is a detail view of a portion of the blower line showing the damper controlling means and the exhaust actuated valve for automatically controlling the action of the blower, the parts being shown in the position which they occupy when the blower throttle and the steam throttle are shut off.

Figure 4 illustrates the same parts after the blower throttle has been opened.

Figure 5 illustrates the same parts after the steam throttle has also been opened.

Figure 6 is a detail view of the blower piston valve after it has been closed by the exhaust.

Figure 7 is a longitudinal sectional view of the blower throttle valve located in the cab, the valve being shown in open position.

Figure 8 is a similar view showing the valve closed.

The locomotive, in connection with which my invention is used, includes a boiler shell 10, from the front portion of which extends a smoke stack 11. In rear of the smoke stack there is a transverse partition plate 12, and spaced some distance in rear of this is the front tube sheet 13, in which are anchored the front ends of the upper boiler tubes 14 and the lower boiler tubes 15. The space between the front tube sheet 13 and the transverse partition plate 12, is divided by a partition plate 16 into a superheater box 17 and a front end chamber 18. Within the superheater chamber 17 is located a superheater header 19 to which are connected the coil units 20, coiled in the respective tubes 14.

The transverse partition plate 12 is provided above the partition 16 and in front of the superheater with series of transversely elongated draft outlets 21, and beneath the partition plate 16, is provided with draft outlets 22, similar to the outlets 21, but about twice as wide. A damper plate 23 is mounted for vertical sliding movement adjacent the transverse partition plate 12, and is provided with series of draft outlets 24, all of which register with the corresponding outlets 21 and 22 when the damper is in full open position, as illustrated in Figure 1. When the damper is lowered to intermediate position, the outlets 21 are closed and the draft through the superheater is shut off, but the lower portions of the outlets 22 are still in registry with the openings 24 in the lower part of the damper. When the damper is dropped to its lowermost position, both the outlets 21 and 22 are closed, and all draft is shut off.

The means for operating the damper 23 includes opposed pairs of arms 25, which engage and support the damper, these arms be-

ing secured to transverse rock shafts 26, and being connected in pairs by vertical links 27. The rock shafts 26 are journaled in suitable bearings 28 secured to the boiler shell 10, and are rocked by means of a crank arm 29, which is secured to one of the rock shafts, where it extends outwardly beyond the boiler shell 10. The crank arm 29 is actuated to rock the shafts 26 for moving the damper 23, through the medium of a pin and slot connection 30 with the upper end of a piston rod 31, which carries a small piston 32 at its lower end.

The small piston 32 is mounted for reciprocation in the cylindrical head 33, of the damper piston valve 34. The cylindrical head 33 is connected by a reduced stem portion 35 with a larger head 36. The damper piston valve 34 is housed within a casing 37, having a reduced portion 38 for receiving the comparatively small upper head 33 of the valve. It will be observed that the valve 34 may move between the upper and lower limits of the casing 37, while the small piston 32 may move between the upper and lower limits of the cylindrical head 33 of the valve, thus defining three positions to which the damper 23 may be moved. In order that the limiting positions of the damper may be adjusted, it is preferred to secure the housing 37 to the side of the boiler shell 10 by means of bolt and slot connections 39, so that the same may be adjusted vertically.

In the absence of pressure within the valve casing 37, both the valve 34 and the small piston 32 will drop by gravity to their lowermost positions, as shown in Figure 3, and the damper 23 will also drop to its lowermost position shutting off all draft through both the superheater chamber 17 and the front end chamber 18. In order to raise the damper, steam pressure is introduced first underneath the small piston 32, raising it to the position shown in Figure 4, where it engages the stops 33^a at the upper end of the cylinder head 33, and raising the damper 23 to its intermediate position to create a draft through the front end chamber 18. When pressure is also introduced underneath the valve head 36, the latter is also raised and the parts occupy the position shown in Figure 5, and the damper is raised to its uppermost position, opening the draft through the superheater 17, as well as through the front end chamber 18.

In the preferred form of the invention, the valve chamber between the heads 33 and 36 is connected with the blower line, so that as soon as the blower throttle valve is opened, the initial opening of the damper will follow. The blower steam is admitted from the steam chest through the pipe 40, Figure 7, throttle valve casing 41 and pipe 42 to the valve casing 37, from which it passes through pipe 43 to the blower piston valve

casing 44, and thence through the pipe 45, underneath the skirt 46 of the smoke stack 11. The small piston 32, when in its lowermost position is slightly spaced from the bottom of the cylinder 33 by stop lugs 47, and the space beneath the piston 32 is in communication with the space between the valve heads 33 and 36 through ports 48. The pipe 42 is preferably a little larger than pipe 43, and as soon as the blower throttle is opened, pressure will be created within the casing 37, and will enter through the ports 48 underneath the piston 32, raising it to the position shown in Figure 4, and raising the damper to intermediate position. The downward pressure on the larger head 36 will still maintain the valve 34 in its lowermost position.

The locomotive throttle valve is connected by a pipe line 50 to the lower end of the valve casing 37, so that as soon as the throttle is opened, pressure is admitted underneath the head 36 to raise the latter and to open the draft through the superheater. It is to be understood that the head 36 is slightly spaced from the bottom of the valve casing by means of lugs 49, so that the pressure reaches the entire area of the head 36 as soon as the throttle is opened.

An automatically actuated blower piston valve 51 is located within the casing 44 between the damper valve casing 37 and the smoke stack 11 to shut off the blower line, while still leaving the draft damper raised and the draft through the superheater open. The valve 51 has two heads 52, which in the position shown in Figures 3, 4 and 5 are on opposite sides of the inlet pipe 43 and outlet pipe 45, so as to leave the blower line open. Connected to the lower end of the valve 51 is a comparatively large piston head 53, enclosed within the enlarged extension 54 of the valve casing 44, and slightly spaced from the lower end thereof by means of stop lugs 55. Leading from the lower end of the casing extension 54 is a pipe 56, which terminates in an enlarged mouth 57, located within an extension 58 of the exhaust line 59 or otherwise connected to the exhaust line. Whenever the blower line is in operation therefore, and the locomotive reaches a predetermined speed, a portion of the exhaust will be trapped within the mouth 57, and will create sufficient pressure underneath the piston head 53 to raise the latter to the position shown in Figures 6, interposing the lower head 52 of the valve between the inlet pipe 43 and outlet pipe 45, and shutting off the blower line when it is no longer needed. This action, however, will not materially retard the discharge of the exhaust around the sides of the mouth 57.

The blower throttle valve casing 41, which is shown in Figures 7 and 8, is located within the cab and contains a double headed pis-

ram valve 60, connected by a stem 61 to a lever 62, and when moved to the position shown in Figure 7 admits steam to the blower line, which also operates the damper 23 in the manner heretofore explained.

When it is desired to close the damper, the valve 60 is moved to the position shown in Figure 8, shutting off the pressure, and venting the steam from the valve casing 38 through the pipe 42 and vent pipe 63 which opens to the atmosphere.

From the foregoing description it will be noted that as soon as the blower throttle valve is opened, the draft through the front end chamber 18 will be opened, but the draft through the superheater 17 can not be opened until the steam throttle valve is opened, thus preventing any danger of overheating the coils 20 before sufficient steam is generated. The position of the damper is automatically controlled first to open the draft through the front end chamber 18 as soon as the blower is applied, and second to open the draft through the superheater 17 as soon as the locomotive is started. As soon as the locomotive reaches a predetermined speed, the exhaust from the cylinders automatically raises the valve 51, and shuts off the blower line when it is no longer needed, while still leaving the blower throttle valve open and the damper 23 in full open position.

From the foregoing description, it is thought that the advantages of my invention will be fully apparent. It is, however, to be understood that the specific details herein shown and described are merely for the purpose of illustrating one means by which the invention may be carried out, and that many modifications may be made therein without departing from the salient features of the invention or sacrificing any of its advantages.

What is claimed is:

1. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a damper therefor normally held in closed position and operating when partially open to permit a draft through the front end chamber and operating when fully open to also permit a draft through the superheater, a blower line for increasing the draft, a valve for admitting steam to the blower line, means connected with the blower line between said valve and the blower outlet and actuated by pressure therein to partially open the damper, a locomotive throttle line, and means in communication therewith and actuated by pressure therein to complete the opening movement of the damper.

2. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a vertically slidable damper

therefor normally held closed and operating when partially open to permit a draft through the front end chamber and operating when fully open to permit a draft also through the superheater, a blower line for increasing the draft, a valve for admitting steam to the blower line, means connected with the blower line between said valve and the blower outlet and actuated by pressure therein to partially raise the damper, a locomotive throttle line, and means in communication therewith and actuated by pressure therein to complete the raising of the damper to fully open position.

3. In a locomotive having a superheater and a front end chamber located one above the other with their front walls in the same plane, and a damper therefor normally held in closed position and operating when partially open to permit a draft through the front end chamber and operating when fully open to permit a draft also through the superheater, the combination of a piston, means operable by the movement of the piston to open said damper, a reciprocating piston valve having a head in which said piston is reciprocable, means for introducing steam underneath said piston to raise the same within the valve and partially open the damper, and means for introducing steam underneath the piston valve to raise the latter with the piston and complete the opening of the damper.

4. In a locomotive the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a damper therefor normally held in closed position, a blower line for increasing the draft, a valve for admitting steam to the blower line, means connected with the blower line between said valve and the blower outlet and actuated by pressure therein to partially open the damper and thereby permit a draft through the front end chamber, a locomotive throttle line, means in communication therewith and actuated by pressure therein to complete the opening of the damper and thereby to permit a draft through the superheater, and means for automatically closing the blower line between its outlet and the damper operating means when the locomotive attains a predetermined speed.

5. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a damper normally held in closed position, a blower line, means for introducing steam into the blower line, a piston, means operable by the movement of the piston to open the damper, a reciprocating piston valve interposed in the blower line and having a head in which said piston is mounted for reciprocation, said piston being operable when steam is introduced into

the blower line to partially open said damper and thereby permit a draft through the front end chamber, means for independently introducing pressure underneath the piston valve to raise the same together with the piston to complete the opening of the damper and thereby permit a draft through the superheater, and means connected with the exhaust line of the locomotive for automatically cutting off the blower line between its outlet and the damper operated means when the locomotive attains a predetermined speed.

6. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a damper therefor normally held closed and operating when partially open to permit a draft through the front end chamber and operating when fully open to permit a draft also through the superheater, a blower line, means for introducing steam into the blower line, a reciprocatory valve interposed in the blower line and having a cylindrical head, a piston reciprocable in said head, means operable by the movement of the piston to open said damper, said piston being operable by pressure in the blower line to partially open the damper, and means for introducing pressure underneath the valve to raise the same together with said piston without interruption of the blower line, to complete the opening of said damper.

7. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a vertically slidable damper therefor normally held closed by gravity and operating when partially raised to permit a draft through the front end chamber and operating when fully raised to also permit a draft through the superheater, a blower line, means for introducing steam into the blower line, a reciprocable valve interposed in the blower line and having a cylindrical head, a piston reciprocable in said head, means operable by the movement of the piston to open said damper, said piston being operable by pressure in the blower line to partially raise the damper, means for introducing pressure underneath the valve to raise the same together with said piston without interruption of the blower line, to complete the raising of said damper, and means connected with the exhaust line of the locomotive and operable when the locomotive attains a predetermined speed to cut off the blower line between its outlet and said reciprocatory valve.

8. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a damper therefor normally held closed, a blower line, a locomotive throttle line, a valve for introducing

steam into the blower line, means operating when pressure is admitted to the blower line for operating the damper to permit a draft through the front end chamber and also operating when pressure is admitted to the locomotive throttle line to complete the opening of the damper and thereby to permit a draft through the superheater, a piston valve interposed in the blower line between its outlet and the first mentioned valve, and a stem trap in the exhaust line of the locomotive and in communication with said piston valve and operable to close the same when the locomotive attains a predetermined speed.

9. In a locomotive, the combination of a superheater and a front end chamber located one above the other with their front walls in the same plane, a damper therefor normally held closed and operating when partially raised to permit a draft through the front end chamber and operating when fully raised to also permit a draft through the superheater, a blower line, a valve for introducing steam into the blower line, a reciprocatory valve interposed in the blower line and having a cylindrical head, a piston operable in said head, means operable by the movement of the piston to open said damper, said piston being raised within said valve head upon the introduction of pressure into the blower line, means for introducing pressure underneath the valve to raise the same together with said piston without interruption of the blower line, to complete the raising of the damper, a piston valve interposed in the blower line between its outlet and the first-mentioned valve, and a steam trap in the exhaust line of the locomotive and in communication with the piston valve and operable to close the same when the locomotive attains a predetermined speed.

10. In a locomotive, having a damper normally held closed, the combination of a reciprocatory piston, means operable by the movement of the piston to partially or fully open the damper, a reciprocatory piston valve having a cylindrical head in which said piston reciprocates, a pressure line for introducing pressure underneath the piston head to raise the same within said head to partially open the damper while the valve remains unmoved, and a second pressure line for introducing pressure underneath the valve to raise the same together with the piston to complete the opening of the damper.

11. In a locomotive having a damper normally closed and movable to partially open or fully open position, the combination of a compound piston valve and piston controlling the position of the damper, a pressure line associated with said valve and operating when under pressure to move the piston within the valve and partially open

the damper, and a second pressure line associated with the valve and operating when under pressure in conjunction with the pressure from the first-mentioned line to raise the valve and piston together to complete the opening of the damper.

12. In a locomotive having a damper mounted for vertical reciprocation and normally held in its lowermost position by gravity, the combination of a vertically reciprocable piston valve having a cylindrical head, a piston vertically reciprocable in said head, means connected with said piston for raising the damper, a pressure line associ-

ated with said valve and operating when under pressure to raise the piston within the valve and thereby raise the damper to intermediate position, and a second pressure line associated with the valve and operating when under pressure in conjunction with the pressure of the first mentioned line to raise the valve together with the piston and thereby to complete the raising of the damper.

In testimony, that I claim the foregoing as my own, I have hereto affixed my signature.

MARTIN J. FURLONG.